Flying Safety

QUARTERS UNITED STATES AIR FORCE • [redacted] OCTOBER 1950

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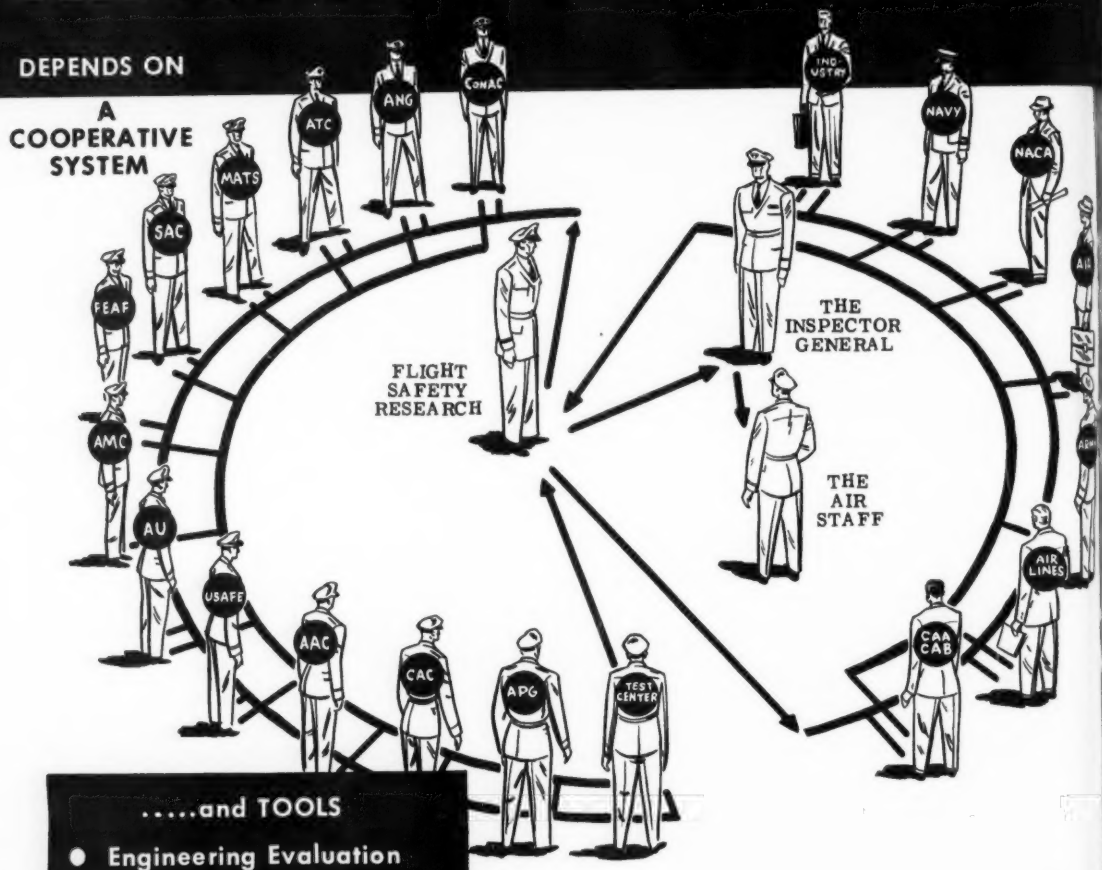
THE PREVENTION OF

AIRCRAFT ACCIDENTS

DEPENDS ON

A COOPERATIVE SYSTEM



.....and TOOLS

- Engineering Evaluation
- Human Research
- Military & Civil Know-how
- Education
- Accident Investigation
- UR & Form 14 Evaluation
- Statistical Analysis
- Experience

The Formulation and Development of policies, stand ards and procedures governing the Air Force Acc dent Prevention Program, and the monitoring of i conduct throughout the United States Air Force the responsibility of the

DIRECTORATE of FLIGHT SAFETY RESEARCH

SAFETY TRAINING

FLIGHT SAFETY can contribute more toward the Air Training Command's accomplishing its flying training mission than any other single factor. Lack of it proportionately hinders our progress.

In our Command we feel a very great responsibility in the whole field of safety because of our mission. All the people who come into the Air Force must first pass through our stations.

This means the entire gamut of flight safety is a team training job for us at the very outset and must be so compact, comprehensive and complete that airmen and cadets gain lasting safety habits which stay with them throughout their time of association with flying activities.

Immediately the aviation cadet arrives at one of our flying training stations his schooling begins in the values and payoffs of safety. Similarly, the airman who one day may be an engine mechanic or crew chief is brought into continuing contact with the principles of safety in a manner as realistic and practical as we can design.

Ours is a beginning job of training a highly efficient team of pilots and technicians performing a thousand tasks associated with flying economically and efficiently. This means the safe way. This beginning safety training has no ending in the Air Force.

Flight safety vigilance can never be relaxed. This is a major subject in our indoctrination program and added emphasis is exerted by our flying instructors.

We have created in our Command, Flying Safety Councils at each base for the primary purpose of devising ways and means to improve our record of safety and to ascertain more effective techniques in flight safety instruction.

Our safety record is improving but is not good enough. Such highly commendable performances as the flight safety mark established by USAF officers and airmen at the gunnery meet last spring at Nellis Air Force Base, are encouraging. But there is still considerable room for improvement elsewhere in our flying program.

We all have a responsibility under express Air Force policy, to offer our personal attention to a continuing campaign to eliminate accidents and particularly to wipe out wilful, deliberate, negligent or careless violations of flying regulations. For these are the factors which mar our flying safety record and have a potential for, or result in, the destruction of property, the endangering of lives and detract from the good name of the Air Force.

We must eliminate carelessness and negligence.

It is not the purpose here to prescribe a rule of invariable punishment or the severity thereof. Rather, it is our purpose to stimulate those associated with flying activities to a greater safety effort. There is a very real need for us to rehabilitate our safety thinking power if we expect to cope successfully with new, faster and more complex equipment.

Our flight safety training job in the Air Training Command looms larger with the swifter pace of today's aircraft and indicates that our beginning job in teaching safety is a continuing one for the whole Air Force.

Flying safety. Two words of wide understandability. The one indicating swift, easy motion through the air and the other freedom from harm or destruction. Words so common that we may have been inclined to skip their vital and practical meaning to us and take them for granted.

It is suggested that all of us consider whether there are any other words quite as meaningful to our Air Force. (u)

Robert W. Harper

ROBERT W. HARPER
Major General, USAF
Commanding, Air Training Command

ABANDON SHIP

YOU CAN SURVIVE AN EMERGENCY AT SEA IF YOU ARE PREPARED

"ABANDON Ship," rang throughout the old freighter. Water, pouring in through bulkheads that had failed during the storm, flooded the engine room. The old ship, loaded to her Plimsoll marks with coal, seemed to be taking water in every seam as she staggered through the hurricane.

There was a rush of crew members for the two lifeboats on the lee side of the ship. Block and tackle creaked as the boats were lowered away. Mountainous seas made maneuvering difficult near the wallowing vessel, and one lifeboat, lifted high by a swell, yawed into the steel plates of the old freighter. The lifeboat was smashed and its occupants thrown into the sea. While the other boat successfully cleared the freighter, a new peril beset it. Overloading and leaking, it fell apart under the strain and pounding. Meanwhile, the old freighter lifted her bows and slid under the sea. Cries of drowning men were lost in the din, leaving only the turbulent sea of whitecaps.

Who was to blame for this loss of lives and ship?

Theoretically, the captain was responsible, but actually, if the lifeboats were over-age and not properly maintained, the owners, officers, crew, and the inspection service must share the blame.

Survival at sea is as real a problem to the Air Force as it is to men who sail the oceans. Our airplanes operate over all areas of the world—jungles, deserts, mountains and water—and consequently require crews trained in the use of a wide variety of survival equipment. If an airman does not have or does not know how to use survival equipment in the desert or jungle, he may survive a few hours or several days. But, unprepared for an emergency over the water, his life is measured in minutes.

A survey of ditchings, crash landings and bailouts* has been made by the Directorate of Flight Safety Research. The survey was conducted to determine what procedures have been most successful in B-29 ditchings, crash landings and bailouts, and the following ditching experiences of USAF crews are representative of the emergencies studied. While they are concerned with B-29 aircraft, the lessons will serve all flying personnel.

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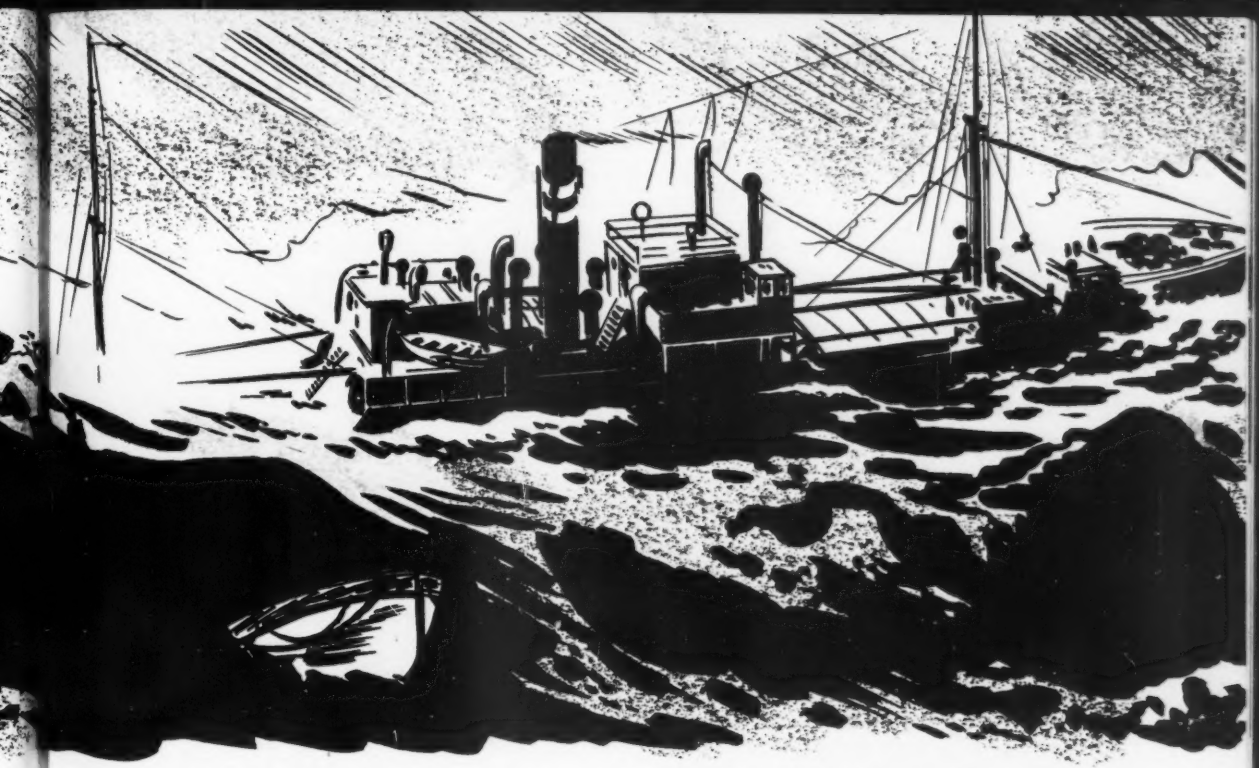
The Ditching—On an over-water search mission, a B-29 developed electrical trouble, resulting in the loss of LORAN, the liaison radio and the interphone system. Later in the flight, the navigator's sextant was accidentally knocked to the floor, making celestial navigation impossible from that point on. The mission was continued by DR navigation, but changing winds along the flight route veered the aircraft considerably off course, and no contact could be made with the ground station for a DF or QDM fix. The

* *Future issues of FLYING SAFETY Magazine will feature the crash landing and bailout surveys.*



pilot decided to ditch the B-29 off the shore of an island assumed to be north of Guam.

Prior to ditching, all crewmembers were notified of the intended landing and after performing the pre-ditching tasks, assumed their proper ditching positions. All equipment that might endanger lives had been jettisoned; the astro-dome was removed by the navigator; the engineer's, pilot's and copilot's escape hatches were opened and ditching braces were installed. Equipment that could not be thrown overboard from the front of the aircraft was safetied. Smoke bombs were dropped on the two sides of the island where a ditching could be effected. Wind directions were determined, and possible headings evaluated. The depth of the water and area subsurface were studied at the final selected point of ditching.

Ditching positions were occupied by the entire crew, and the pilots were secured by safety belts and shoulder harnesses.

Final approach was made at an indicated airspeed of 97 mph with approximately three-fourths power, full flaps extended. Twelve seconds prior to contact with the water, the engineer was ordered to cut all switches. Touchdown was executed at 95 mph, and the aircraft traveled approximately 200 yards before coming to a full stop.

All crewmembers were immediately accounted for and found to be uninjured. After making sure that no fire existed, all equipment needed for survival was removed. With the assistance of island natives, the emergency radio equipment was put into operation and kept in operation until rescue crews arrived. Each crewmember was assigned a task vital to crew survival, and by the next afternoon rescue crews arrived on the island.

The Findings—Not only was the ditching and preparation for ditching orderly, but the crew did not consider its job completed when the aircraft came to rest and they waded ashore. Some of the uses for available equipment were reported as follows:

Chutes were used for bedding and mosquito netting.

One-man life rafts were used as oil containers in case signal fires were to prove necessary.

All flares were removed from the dinghies.

Personal equipment and non-classified pieces of the aircraft were used as barter items to obtain help, food and water from the natives.

The one large, seven-man life raft was used to gather rainwater. (The only safe drinking water in remote areas in the event purification equipment is lost or destroyed.)

All classified equipment was completely destroyed (in the presence of all crew members).

The Recommendations—That crews practice bail-

out and ditching procedures as frequently as practical in order to be proficient in their individual duties at all times. That emergency equipment be actually used during practice whenever possible.

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The Ditching—A B-29 with 20 persons aboard became lost while on an over-water flight and it became necessary to ditch the aircraft in high seas. The two bomb-bay loads of equipment were salvoed, and all loose equipment was jettisoned. With approximately 20 minutes fuel left aboard, the ditching was accomplished. Seas were high and the aircraft was headed into a 35-knot surface wind. Approach was made at an indicated airspeed of 95 mph, 25 degrees of flaps and gear up. All hatches and windows were opened prior to contact with the water. Approximate landing weight was estimated at 79,000 pounds. The aircraft was landed on the crest of a 40-foot wave in a five-degree nose-high position.

The ditching was accomplished without loss of life; however, two crewmembers subsequently perished in the high seas after jumping into the water without their one-man dinghies. The remainder of the crew was rescued two days later in an exhausted condition. It is worthwile to note a portion of one airman's statement at this point:

"... it was just fortunate that I happened to run across the hand-operated flares stored with the Very pistol ammunition to the rear of the navigator's position. After reading the instructions on these flares and noticing what their use was, I gave one of them to the copilot and kept one myself in case we were separated ..." It was later determined that those two flares were an important contributing factor in the rescue of the crew. Signal mirrors were available; however, there was a complete overcast during the entire time the crew was on the water.

The Findings—Although the ditching was successful, considering the extremely rough condition of the water, two men lost their lives. The factors contributing to the loss of these lives were:

The individuals jumped into the sea without their one-man rafts even though the crew knew of the situation for over 30 minutes prior to the actual ditching.

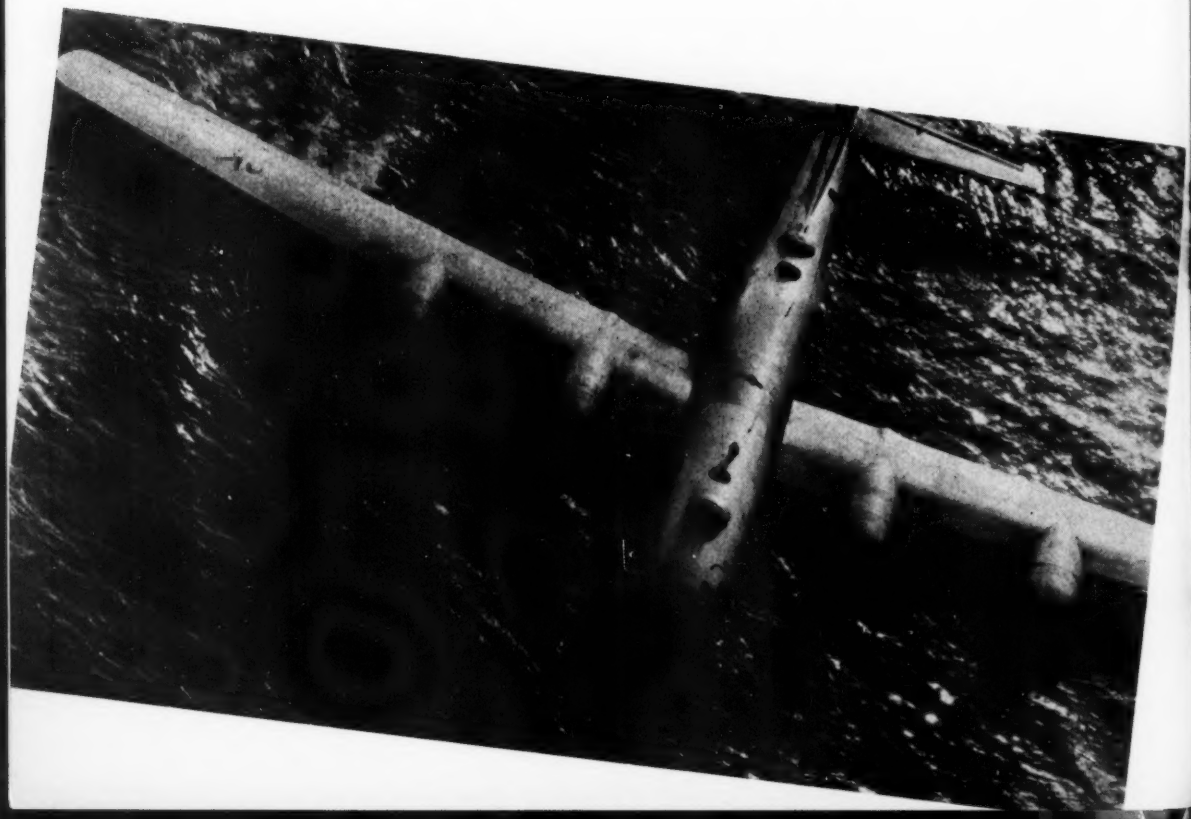
Failure of the right-hand main raft to inflate when ejected from the airplane.

High seas and winds in addition to the necessary overloading of the two main rafts.

The inability of the overloaded rafts to navigate under the existing conditions.

The Recommendations—That one large raft be placed on board each aircraft for every six men when an over-water flight is contemplated.

That the exact contents be stenciled on the top of the inflated portions of the life raft directly over each



storage compartment. In the case of an overloaded raft, it is impossible to move the personnel around in the raft in order to search for needed emergency equipment.

That smoke pots and vividly colored balloons, complete with helium inflation bottles and static lines, helpful daylight signal equipment, be included in raft equipment.

That crewmembers be cautioned *not* to inflate the Mae West prior to crash landing and evacuation of the airplane. In cases where the aircraft has broken up during water landings, it has often been necessary for the occupants to escape by swimming under water from the trapped sections.

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DITCHING PROCEDURES

The various procedures recommended in Tech orders, AF manuals and lessons from actual crew experiences in ditching are summarized here. Appropriate publications should be studied for detailed procedures for each crewmember and other types of aircraft.

Drill is the nearest approach to the reality of ditching itself. The crew must learn to move quickly and to make every movement count. Make use of wet drill practice equipment if available, in order to comprehend more fully the ditching procedure.

A well-trained crew will understand the ditching problems and know how to handle them when they occur. Talk ditching over with the rest of the crew and practice it again and again.

AIRPLANE COMMANDER'S DUTIES

It is the responsibility of the airplane commander to see that the proper ditching drills and inspections are carried out. Crews must be trained in their proper ditching duties in accordance with the individual instructions contained in USAF Technical Order AN-01-20EJA-1.

CREW RESPONSIBILITIES

Ditching calls for a more coordinated effort on the part of the crew than does any other procedure. Before each over-water flight, an inspection must be accomplished of every life raft, CO_2 cartridge, hand pump, flashlight, emergency ration, medical kit and life jacket. Each crewmember must check his life jacket by mouth and see that the CO_2 cartridge is in place. Replace all defective jackets. Make sure all emergency equipment is in its proper place and is in readiness to enable the crew to evacuate the airplane and await rescue.

Individual crewmembers should be assigned the responsibility for removing the following equipment from the airplane:

a. Life raft radio
b. Raft accessory kits
c. Sustenance kits
d. Extra life raft (to be released and inflated)
e. Emergency signal kit
f. Blood plasma kit
g. First aid kits (2).

WHEN TO PREPARE FOR DITCHING

The first steps for a successful ditching are taken at the first sign that the aircraft *might* be unable to continue on to a successful landing.

The following must be accomplished at the first indication of trouble:

a. Warn the crew of the possibility of ditching;
b. Get an exact "fix" from the navigator;

c. Instruct radio operator to contact the proper agencies and inform them of the situation. Keep them informed.

With the aid of the navigator and flight engineer, compute the point where the ditching will take place and *immediately* broadcast that information on all command and VHF frequencies. Have the radio operator contact the ground control station and the Air Sea Rescue station for the area where the ditching will be accomplished. The following information should be transmitted in order to aid rescue agencies in determining how best to afford immediate aid and rescue:

a. Altitude
b. Heading
c. Airspeed
d. Ground speed
e. Remaining fuel and estimated remaining time in air
f. Time and place of proposed ditching.

Inform radio contacts *immediately* of any changes in your status or plan. Do not hesitate to alert these agencies even though there may be a possibility of not having to ditch.

PRE-DITCHING PLANS AND PROCEDURES

Once it has been established that a ditching is necessary, make every moment and foot of altitude count.

Attempt to reach the point of ditching with two hundred gallons or less of fuel for each engine. Do not wait until all fuel is exhausted before attempting to ditch.

Jettison all bombs, the bomb sight, and loose equipment that could cause injury. Do not open bomb bay doors except to salvo bombs and do not drop empty bomb bay gas tanks.

Check with all crewmembers to determine that the necessary gear has been properly stowed and that each man is briefed as to the equipment he must remove after ditching.

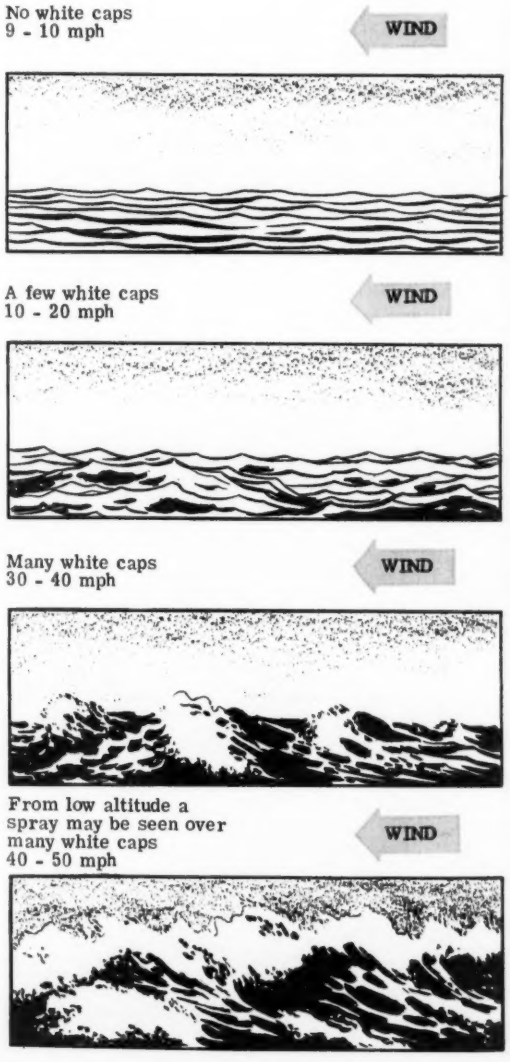
Have crewmembers remove flak suits, parachute harness, winter flying boots; loosen shirt collars, and put on exposure suits if time permits. Flak helmets will be worn by personnel able to brace their heads and necks against a solid structure. If position does not allow for bracing head and neck, do not wear a flak helmet. After completing all required duties, each crewman will report that he is in his assigned ditching station with a parachute, one-man raft and any cushions available.

HANDLING THE AIRPLANE (ALL B-29 MODELS)

Altitude—Altitude can be judged without difficulty if there is a wind. Above a calm sea, the airplane commander must be more alert in his judgment of height. If power is available and altitude is not needed to locate land or surface craft, descend to a lower altitude and study surface conditions. At night, the landing lights may be used at various angles to judge altitude.

Wind Direction—Plans for ditching cannot be made without taking the wind into consideration. Waves move downwind. Swells, however, do not always indicate wind direction and can, in fact, be very large when the wind is calm. It should be remembered that the sea is usually rougher than it appears from an airplane flying at 2,000 or 3,000 feet altitude.

Wind Speed—Surface winds are fairly predictable from the way they affect the water. The following



is noted as an aid to determining surface wind velocity:

a. No white caps—9 to 10 mph
b. A few white caps—10 to 20 mph
c. Many white caps—30 to 40 mph.

From low altitudes, a spray may be visible above the many white caps. This indicates a very strong wind (40 to 50 mph).

Normal Ditching Procedure—Experience gained in ditching B-29 airplanes has shown that the best results may be obtained by following the procedure listed below:

Ditch while power is available—Power will allow the airplane commander to choose a spot for ditching to obtain the best possible sea conditions and the most favorable landing conditions and attitude.

Speed and Attitude—At the time of contact, attempt to have the lowest possible forward speed consistent with safe control of the airplane. This will reduce the landing impact. Under no circumstances should the airplane be stalled in, as this will result in a severe impact and cause the airplane to nose into the sea.

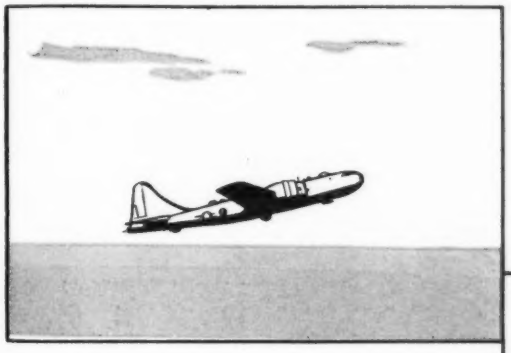
Ditch at the lowest possible rate of descent—100 feet per minute is recommended.

Ditch the airplane five degrees nose high—This attitude gives the best distribution of landing shock over the fuselage. (Note: A five-degree nose-high angle is the same as the normal landing attitude.)

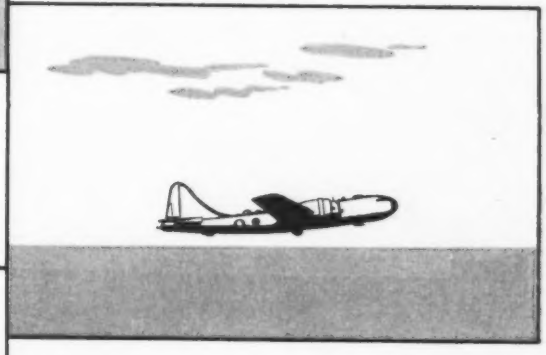
Use a flap setting of 25 degrees—This flap setting is recommended in most cases; however, the primary object is a low rate of descent with as low a forward speed as possible. Flap settings should be varied according to the weight of the airplane and the power available.

Avoid touching down in a nose-down position—This will cause the airplane to dive upon impact. Flare out just above the water and maintain an approximate normal landing attitude at impact.

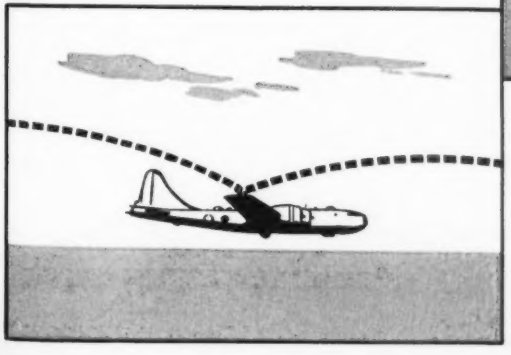
Choose the direction of the ditching run carefully—If a uniform wave or swell pattern exists, best results will be achieved by ditching parallel to the waves or swells. If the sea is calm, or if interfering



TOO Steep—Severe Tail Shock



5 Degree Angle is Ideal



Too Shallow—Causes Bouncing, May Nose In

waves and swells are running with winds 30 mph or higher, the best procedure is to ditch into the wind.

Power off and partial power ditching—In ditching with one or more engines inoperative, the following should be borne in mind:

With two engines operative on the same side of the airplane, use power on the inner engine *only*.

If power is available from numbers two and four engines, considerable power may be used for control.

With symmetrical power conditions, use power as required to give flattest approach and the lowest possible forward speed.

On letdown with any engine inoperative, it is advisable to hold the airspeed 30 mph above stalling speed until flare-out, at which time the speed will be reduced to just above the stalling speed as the five-degree nose-high landing is assumed.

Night Ditching—Night ditching should be conducted with the aid of instruments to establish proper attitude of the airplane.

Hold the wings level to avoid digging a wing into the sea and cartwheeling the airplane.

If power is available, drop flares and use landing lights to examine the sea surface. If conditions are favorable, choose a ditching heading as recommended previously. If it is impossible to judge the surface conditions, head into the wind and use any existing knowledge of the prevailing winds or a wind fix.

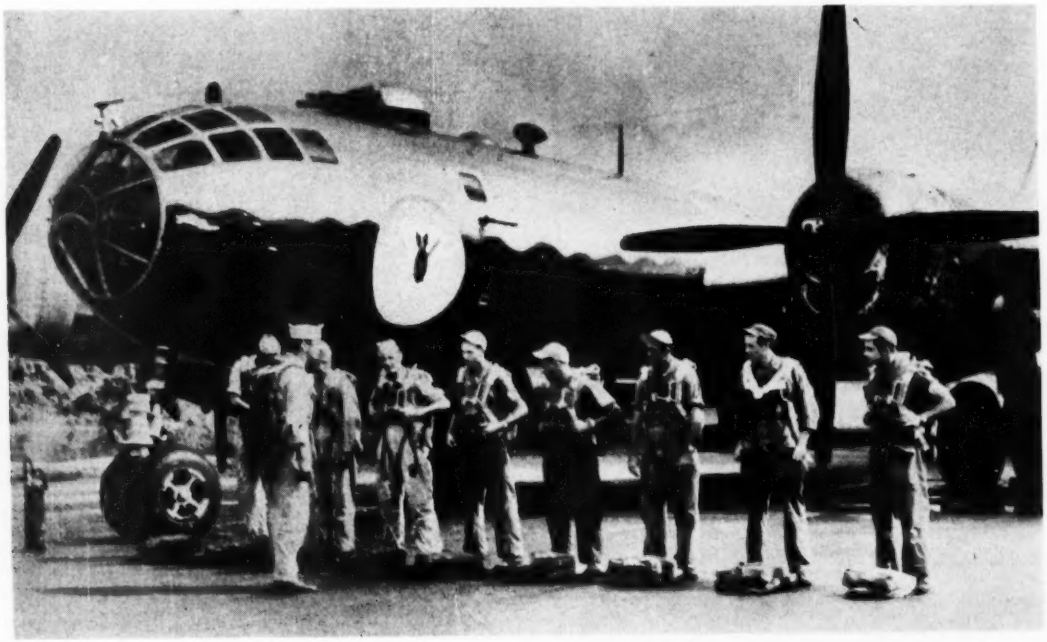
Make an instrument letdown, holding the airspeed 30 mph above stalling speed, and at the lowest possible rate of descent. Landing attitude, with power available, should be five degrees nose-high, with 25 degrees flap. If no power is available, or unsymmetrical power is used, no flaps should be used.

The trailing antenna full out will aid in judging the height while leveling off. The radio operator will inform the airplane commander when the trailing antenna grounds out. At this point, the aircraft will be approximately 100 to 110 feet from the surface of the water.

After choosing a ditching heading, if power is available, drop remaining parachute flares in a line, make a procedure turn and land alongside the flares.

Air Force letter 121-34 stipulates that all commanders must make a thorough inspection of all survival equipment to make certain that each life raft is fully equipped and that all survival equipment is aboard and in its proper place.

While it is the responsibility of the commander to see that these periodic inspections are made, it does not relieve the pilot or any other crewmember of his individual responsibility in seeing to it that the proper equipment is on board or that he is fully familiar with its use. It is too late for inspection once the emergency presents itself. (R)



LOST

A NAVIGATION TRAINING FLIGHT THAT ENDED WHEELS UP

True or False ☐?—Before descending to destination, jet aircraft should remain at altitude (if there still is fuel in the tanks) until the pilot is positive of his position.

True or False ☐?—Pilots should use all means of navigation available rather than rely primarily on the radio compass needle.

Did you answer both *True*? If you did, you may avoid the experience of one pilot. He figured, with his flight leader, that it would take an hour and-a-half to make the flight of less than 600 miles. Thunderstorms were forecast on the route and the forecaster told them they would have headwinds up to 80 knots. The flight, in TF 80's, was being made for navigation training. Shortly after takeoff the flight leader called in on top of the lower overcast at 6000 feet. Both jets were in formation at this time, and they continued to climb in the clear on course up to 25,000 feet. At this time the flight leader penetrated another overcast and instructed his wingman to remain 1000 feet below him.

The wingman flew along as instructed and made a position report as 50 miles north of *Enroute* Radio Range, crossing the north leg, 30,000 feet, in weather, four minutes before the flight leader reported over the same fix. At this time the flight leader called the wingman, instructing him to meet him at 30,000 feet over their destination in the clear.

About 23 minutes later, the wingman tuned in the radio range at his destination. The compass needle pointed to 270° and then to 200°. He made a 180° turn and headed to the station with the compass needle pointed at 360°. After flying seven minutes toward the station, he made a 180° turn and flew seven minutes away from the station. At this time he contacted his flight leader by radio and reported that he could see the ground and was going to let down with 168 gallons of fuel. After descending to 12,000 feet at a point he presumed to be his destination, he could not see the town or airport and knew he was lost. He reported the situation to his flight leader, and tried to alert Military Airways and the radio range station but could not raise them. An Airways station finally made contact with the pilot, but was unable to give him a steer.

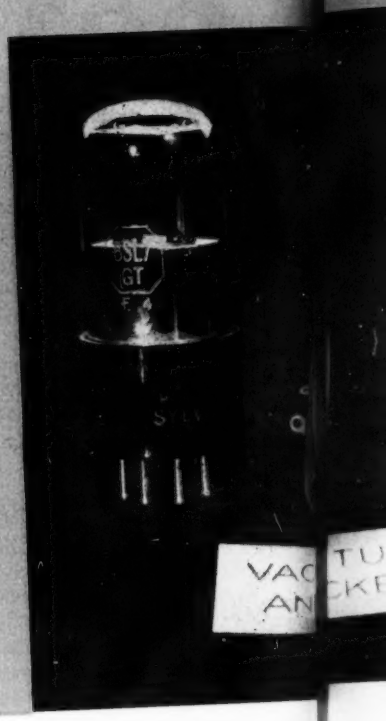
After crossing foothills near a familiar mountain peak, the pilot realized his position and tuned in the radio range at his destination and the compass pointed to 240°. He then tuned in a nearby range and the compass pointed to 150°, and considering it to be closer, immediately took up a heading for it. When the fuel indicator pointed to four gallons, the pilot jettisoned his tip tanks and picked out level ground for an emergency landing. On the final approach, the engine quit because of fuel starvation and a wheels-up landing was made.

During the flight and just prior to letting down, the pilot noticed build ups and thunderstorm activity in the vicinity. This activity evidently caused an erratic reading on the radio compass. (R)

". . . The ability to navigate is the ability to fly in instrument conditions. This is true in the long and short range type of navigation problems, as well as the extremely short and precise systems which are required for an aircraft to approach and find its landing runway under conditions of low visibility. To prove this point further, an analysis of aircraft accidents that have occurred in instrument conditions will show that in almost all cases where pilot error was involved, his error was concerned with navigation. He either couldn't find the point to which he wanted to go or else thought he was in a different position than he actually was."

COLONEL JACK TAYLOR, USAF
Chief, All Weather Flying Division
Headquarters, Air Materiel Command

TOM THUMB EQUIPMENT



MIGHTY MOUSE HAS NOTHING ON THE USAF WHICH ALSO LIKES ITS STRENGTH IN SMALL PACKAGES

While today's modern fighter and bomber aircraft continue to grow in size and complexity, a "Tom Thumb" miniaturization trend follows proportionately to reduce the size and weight of aircraft equipment to allow for a corresponding increase in pay load. Currently, the Components Development Branch of the Electronic Sub-Division, Engineering Division, Air Materiel Command, is completing a two-year-old project to reduce the size and weight of electronic equipment—such as radio and radar—by as much as 50 per cent.

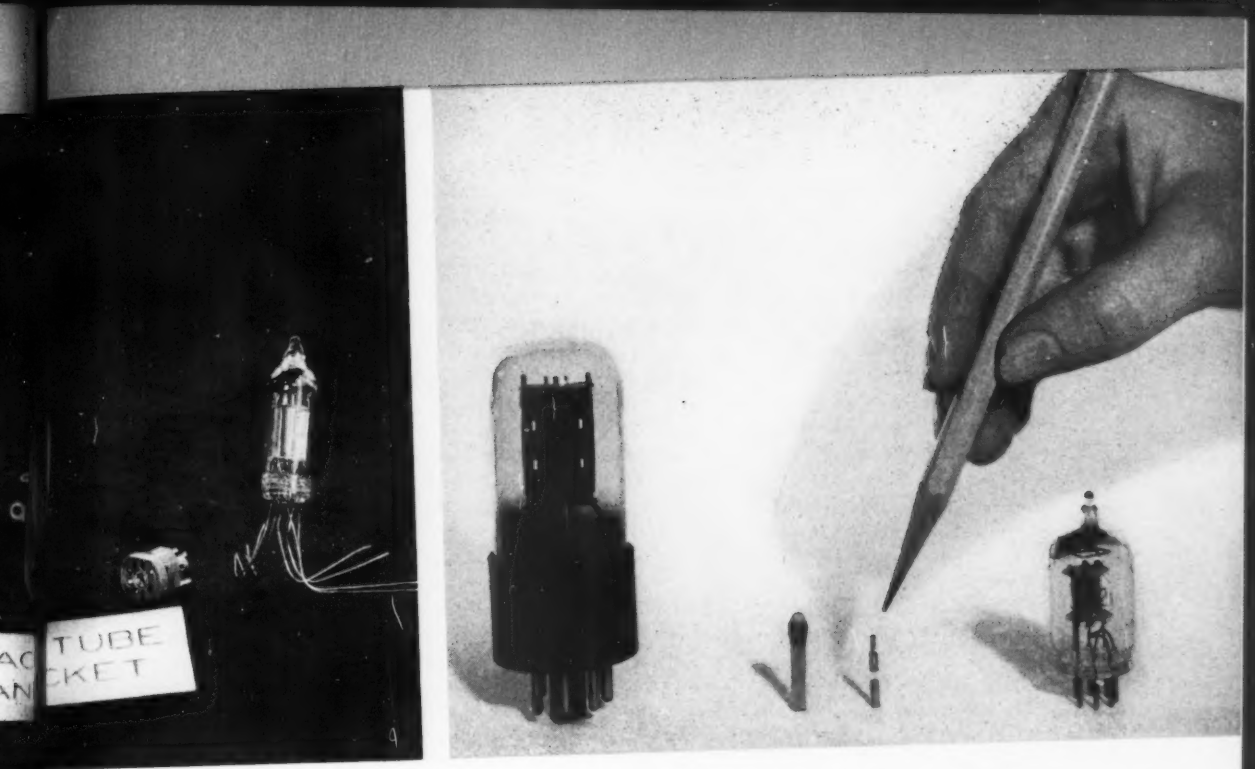
This project covers the "reducing" of capacitors, resistors, transformers, circuits, switches, vacuum tubes, and wires without a loss in efficiency of operation. The increased flight speeds and precision bombing call for more and more electronic equipment, but the slim, sleek lines of new planes leave less and less room for this equipment. In some cases, weight is less of a factor in design than size. The streamlining of aircraft has emphasized the problem of size. In the new high-speed jet aircraft, weather and night flying without electronic equipment has become all but impossible. Some of these airplanes now have as many as 17 different types of such equipment weighing more than two tons.

Other advantages of the miniaturization of instruments and equipment are the savings in manpower, money, and industrial facilities in manufacturing; the reduction in the amount of strategic materials and storage space required, and the alleviation of transportation problems.

Since the heart of all electronic equipment is the vacuum tube, AMC engineers have designed tubes which are 100 per cent as efficient as those of standard size but which have been reduced in size by 80 per cent. Those smaller tubes are approximately two inches in length and the diameter of a pencil.

For instance, the "Tom Thumb" synthetic radio tube, about the size of a match head, may be the Air Force's answer to the question of how to reduce further the weight and size of its airborne electronic equipment. Called a "fieldistor," the sub-miniature tube is now in the early stage of development at the Air Materiel Command's Components and Systems Laboratory.

Being only 1/90th the size of the present-day tube, the "fieldistor" offers tremendous advantages from a weight and space standpoint . . . an all-important factor in aircraft equipment. In appearance, it resembles the end of an eye dropper. Ten of them



The tiny vacuum tubes are as efficient as their big counterparts.

could be carried in an ordinary thimble.

Possible adaptation of the small tube to wide usage is seen in such items as radio, television, hearing aids, fire and burglar alarms, thermostats, etc.

"But don't expect to see any of the new devices in many items for some time yet," says Colonel Duggar, Components and System Lab chief. "The 'fieldistor' is still in the process of development." For one thing, the tube is still a bit too noisy. About 250 have been made to date, by hand, and the cost is high. With mass production methods, however, the cost should come down.

The small size and structure of the "fieldistors" will also enable them better to withstand engine vibration, gunfire, and landing shock which literally shakes the life out of the conventional tube. Since modern aircraft use hundreds of tubes, the space and weight saved by use of the "Tom Thumb" devices, plus their greater resistance to abuse, means longer aircraft ranges at reduced operating costs.

Another big advantage of the new tube is that it uses so little current that most batteries can be eliminated.

Rectifier tubes have been reduced in size by 95 per cent and in weight by 92 per cent. Power transformers, which in standard size weigh 6.06 pounds and have a volume of 65.0 cubic inches, have been miniaturized to 2.19 pounds and 28.8 cubic inches. A standard three-stage amplifier which measures 6x4x4 inches has been reduced until it measures about the size of a saltine wafer.

This reduction in size of components is only one method used to achieve miniaturization. Electricity passing through components of electronic equipment creates heat which must be dissipated for satisfactory operation. It is common practice to leave sufficient space for ambient air to cool the components. Since space is at a premium in miniaturization, other methods of cooling must be devised. Tests have indicated that it is possible to use standard sized components and still achieve smaller over-all measurements by using forced cooling methods which will permit closer placement of parts. New materials with higher heat-resisting capacity—such as ceramic insulated wire, glass insulation, teflon-covered wire, and silicones—are now used and resist heat up to 200 degrees Centigrade, as compared to 50 degrees for materials formerly used.

Freon, a liquid commonly used in refrigeration, has been used in experiments on cooling electronic com-

ponents. An ordinary 50-watt light bulb soon becomes too hot to touch, but when sprayed with Freon it remains completely cool.

At the Components and Systems Laboratory is a radio set completely immersed in cooling Freon. Not only does the set operate perfectly in its liquid bath, but it is predicted that it will outlast sets which operate under ordinary conditions. The liquid protects against atmospheric damage and its cooling features eliminate danger of burn-outs or explosions. By drawing the heat away from the hot points, and spreading it over the entire area of the radio it is possible to reduce the over-all size of the article and still achieve maximum efficiency of operation.

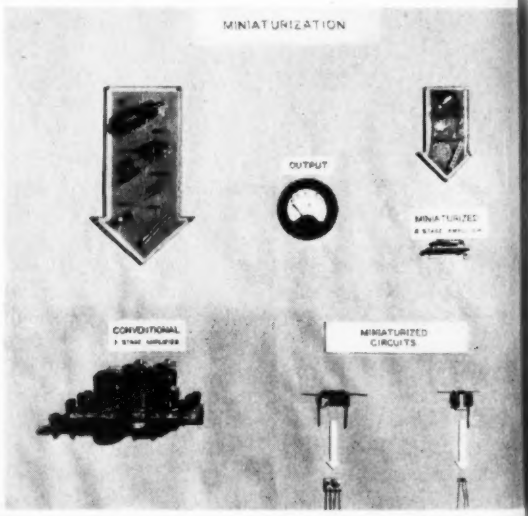
At the same time the Components Development Branch is attempting to develop a "guaranteed" life of 1000 hours for each component. The average life, explained the engineers, might be 10,000 hours, but "guaranteed" life is the absolute minimum number of hours a piece of equipment will serve. The development of "guaranteed" life has been made possible by the shock-resisting qualities of the small components and the use of more suitable materials, including ceramics in hermetically sealed equipment.

Experiments have also been conducted in the use of "printed" circuits and components. A conducting metallic ink is embossed, stamped or printed into plastics or ceramics and performs the same functions as those performed by wires and components in standard or conventional methods of fabrication. Using this method of fabrication, equipment can be considerably smaller than the standard counterparts.

With the completion of the project, engineers at AMC will combine all known methods of miniaturization in the development of one complete aircraft radio set which will be no greater than one-fourth the size of the standard set currently in use. Circuitry and design will remain unchanged and the diminutive creation will serve as a study and experimental model for further tests on decreasing the size of components, techniques of sealing, methods of cooling and protection against damage.

Although miniaturization has proved its value, it is still in the experimental stage. Tests are still being conducted in an effort to achieve even greater reductions in size, and the ultimate goal of the USAF is an 80 per cent reduction in the size of all electronic equipment. When this has been achieved, the components will be standardized and future aircraft will be equipped with pint-sized equipment which will pack a giant wallop in efficiency.

That will increase the safety factor. (U)



ABOVE—A comparison of parts shows a conventional 3-stage amplifier measures 6 x 4 x 4 when made up of standard sized components. Reduced, the amplifier is no larger than a saltine wafer. LEFT—This radio can still pick up hot tunes even though it is partially submerged in Freon refrigerant, which gives protection against atmospheric damage and danger of burn-outs or explosions.

CAUSE: UNKNOWN

"I ALMOST clobbered it today. . . ."

"Another thousand feet and I would have been a goner. . . ."

"Did you hear about the close one I had on that last trip?"

Those are familiar introductions for bull sessions around coke machines and snack counters, on the flight line, in ready rooms, and anywhere else officers and airmen do their hangar flying.

Unfortunately, such incidents are soon forgotten as other interests take their place. Then, what was a mild fright for one man today may develop into tomorrow's tragedy for another man because no one took it seriously.

Accidents in which the cause cannot be determined are increasing. This is because in all too many cases the pilot or other crewmembers are not alive to tell what happened. In many cases the sequence of events is similar—the airplane was apparently out of control, spiraled into the ground and exploded on impact, or, to use another pattern—fire from unknown source forced abandonment of the aircraft.

The causes of such accidents might be complex and again they might be simple to correct, *if known*. Perhaps other pilots or crews have been close to similar emergencies but considered the incidents trivial and not potential causes of accidents.

In the airplane you fly, is there equipment that can break loose in turbulence and jam the controls? Do your boots or shoes snag on the scuff plates or on other parts of the cockpit when operating the rudder pedals? Has fuel spilled from fuselage tanks during slow rolls? Has your finger ring, gloves, or flight clothing become entangled on a projection or switch during an abrupt control movement?

Those are examples of potential hazards that if known may prevent accidents. Without knowledge of such incidents, engineers responsible for aircraft design modifications cannot remove the difficulties.

In an all out effort to reduce the loss of life and airplanes, it is highly desirable that all Air Force personnel report any and all unusual incidents. These can be sent by informal letter to the Director of Flight Safety Research where they can be studied and evaluated. It may be that the incident you feel wasn't important could be the means of saving your own and someone else's life.

Research in the field of Flight Safety is every airman's business. It is not a function that belongs exclusively to crash investigators, engineers and statistical analysts. The Directorate of Flight Safety Research heads up the organized effort to reduce aircraft accidents, but this does not relieve each pilot and mechanic of the obligation to contribute to the advancement of his own profession. Research, by definition, is "a diligent investigation for the purpose of adding to human knowledge."

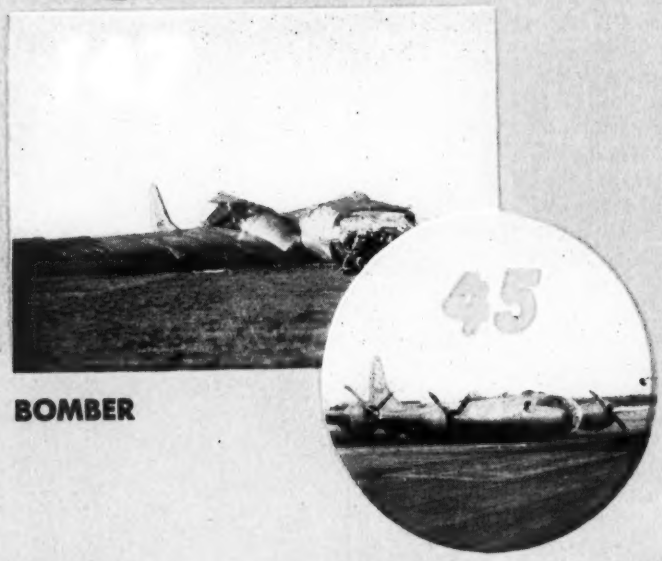
To add to human knowledge of Flight Safety is clearly among the capabilities of every competent and mentally active Air Force member. (R)

LET'S STOP LA

KEY

TOTAL ACCIDENTS, FIRST HALF 1950

APPROACH AND LANDING ACCIDENTS, FIRST HALF, 1950



BOMBER

FIGHTER

THE most critical time in any f approa
six months of this year, 47 per ce aircraf
phase of flight. Constant vigilan will
Maintenance malfunctions and su , if eli

How is Y Tech

Adherence to ALL of the landi
accidents:

Initial Checkout—complete ilot on
and performance and sufficient ch ions in

Cockpit Checks—pilot must now a
plane in which he is current.

Proper Approach Speed—ma peed du

Pattern—maintain normal p of airc
lowing zoom and half-roll peel-o any p

Gear and Flaps—make comp lap che

Normal Landing—touch do one-thi

Runway Alignment—align a nway a

Landing Roll—maintain co of airc

Brakes—use brakes judicious

Proficiency—maintain maxim in typ

Pilots must be impressed wi for g
that landing conditions are not pilots
maneuver performed when necess a goo

...ING ACCIDENTS

TOTAL USAF
FIRST HALF
1950

975
461

...approach and landing. During the first ... aircraft accidents occurred during this ... will prevent most landing accidents. ..., if eliminated, can prevent the rest.

... Technique?

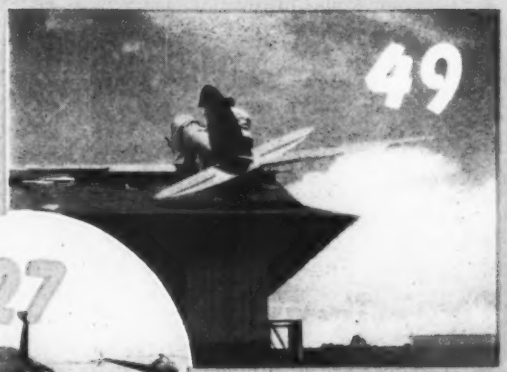
... landing factors will prevent serious

...ilot on aircraft landing characteristics ...ions in trainer aircraft.
...now a definite procedure for each air-

...peed during all phases of approach.
...of aircraft flown. (Tight patterns fol-...many pilots.)
...lap check.
...one-third of the runway.
...nway and maintain alignment.
...of aircraft throughout landing roll.

...in type of aircraft in operation.
...for go-around procedure in the event ... pilots are respected and a good pilot. (R)

CARGO



MISCELLANEOUS

PILOT'S

THE CHOICE MADE IN THE COCKPIT DETERMINES

SOMETIMES there is a fine line between success and failure. No two emergencies in aircraft are exactly alike. That is why the judgment of a pilot is so important.

One day a pilot will find himself running out of runway and his plane still not airborne. So he quickly makes the decision to collapse his landing gear and abort the takeoff on the plane's belly. Accident investigators may find that he *could* have taken off from the runway remaining. Another day, another pilot will find himself in somewhat the same situation, except that this time the runway actually is too short and he will fail to abort the takeoff until too late and crash at the edge of the field. Accidents have occurred under both circumstances, yet in nearly all cases they were caused by insufficient knowledge of runway lengths and of the effects of temperature and altitude, as well as by ignorance of the performance characteristics of the aircraft. Lacking such knowledge, pilots make errors in judgment.

Air Force jargon has it that when a man gets in a tight spot and doesn't know what to do, he "pushes the panic button." Now the panic button should not be confused with the bail-out button nor the ditching alarm.

Here are three recent incidents that might have been disasters. Who can say, not having been in the cockpits, that the pilots in their judgment were exactly right? Yet the fact remains that the pilots did not push the panic button and they did save three airplanes.

• • • • • • • • •

A Training Command base is one T-6 ahead today because an aviation cadet decided to stick with his plane rather than hit the silk.

The cadet made a successful pancake-landing in a cotton patch after his engine conked out and his plane caught fire while flying in formation at 4,000 feet. When his engine started sputtering, the cadet contacted another aircraft in the formation and reported that his plane was on fire.

"Maintain altitude and bail out," came the advice from an instructor.

The cadet, however, decided to try and land the trainer. He sighted a level spot and deadsticked his plane into a perfect belly landing.

Crash trucks and fire trucks from the base, notified of his approximate location, arrived on the scene shortly after the plane had set down, but the landing jolt in a muddy field put out the fire and they were not needed. The plane could be economically repaired.

• • • • • • • • •

The manner in which a B-29 pilot successfuly put out an engine fire follows:

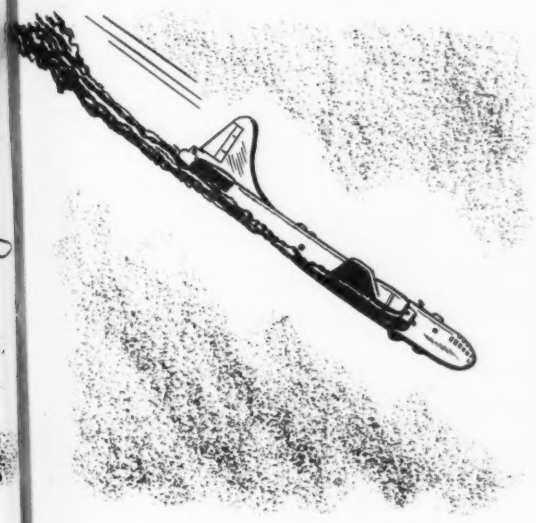
The incident occurred when he was flying at 10,000 feet, on instruments. The engines appeared to be operating normally when there was a loud, plane-shaking explosion. The right scanner notified the pilot and engineer that number four engine was on fire. The engine was feathered and both fire extinguishers were used to no avail. The crew had been alerted to stand by and the pilot put the plane in a dive, attempting to blow the fire out. Descending at a rate of 3500 feet per minute and 270 mph, he had just started to level out at 5,000 feet, slowing the plane down, preparing to bail the crew out, when the fire went out. The plane was flown back to its home station on three engines, without any further trouble.

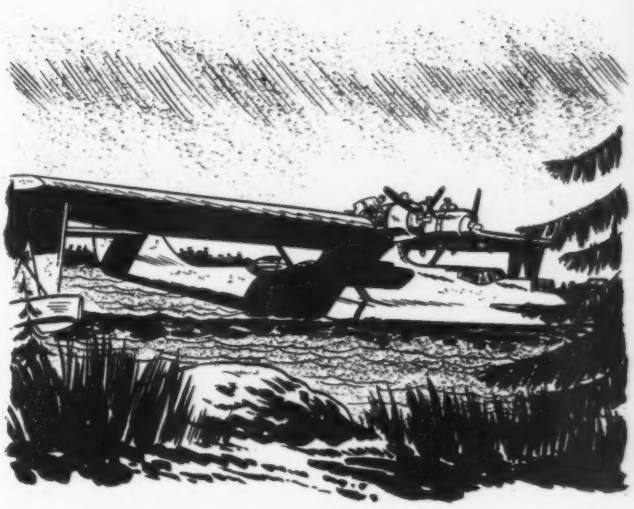
• • • • • • • • •

Upon arrival over a northern lake where he was to deliver a rescue team, a pilot noticed that the left engine of his SA-10A was running slightly rough.

DECISION

AN EMERGENCY BECOMES AN ACCIDENT OR AN INCIDENT





All instruments were reading normal, and the roughness was attributed to carburetor ice. Despite strong gusty winds and rough water, a safe landing was accomplished. Upon inspection of the left engine, it was found that the number one cylinder was split.

A beaching was necessary to repair the engine, and a tug operating on the mercy mission was invaluable in accomplishing this. It is no small task to beach a big amphibian in a lake filled with stumps and surrounded by rocks.

The necessary tools and another cylinder were brought to the lake by a ground party and transported to the airplane by the tug. After three days of work under the most adverse conditions, the repairs were completed and the engine run up. The left engine proved to be in poor condition, but the pilot elected to attempt the water takeoff in hopes of attaining sufficient altitude and airspeed for safe single-engine operation. The airplane was lightened as much as possible, and a minimum crew of pilot, copilot and engineer was carried for the flight back to an AF base 30 miles away.

With full power on the right engine, and approximately two-thirds power on the left engine, takeoff and climb to 400 feet was accomplished when the left engine failed completely and was feathered. Orbiting over the lake, so as to always be able to make a landing, the pilot utilized updrafts in an attempt to gain a minimum altitude of 2,000 feet for the flight to the AF base. After approximately 30 minutes, he was successful in climbing to an altitude of 2,100 feet. Power was then reduced on the good engine, and the flight proceeded to the home base.

It was assumed by the pilot that one or both brakes might be frozen, the wheels had been immersed in lake water for three days and then subjected to the low temperature at 2,100 feet on the return flight. After a normal single-engine approach with gear lowered on final, his assumption was proved correct. The aircraft touched down 75 feet after passing the end of the runway and the left wheel refused to turn. No left engine power was available to counteract the frozen left brake; however, he stopped the aircraft with no swerving and no damage, except for a blown left tire.

• • • • • • • • •

Now consider those three incidents. Would you have done the same thing, under the circumstances? (U)

MEDICAL SAFETY

PILOT REACTION

It is a well-known fact that the design of the human body is becoming the principal stumbling block in the path of development of high speed military aircraft. By the same token, the development of such high speed and high altitude jet craft has added considerably to the woes of a pilot. With this greater speed and maneuverability, his time discriminative period has been reduced from seconds to little more than flashes of time. Engineering psychologists are endeavoring to design and develop flight equipment to meet this challenge and thus permit the human operator to function efficiently and safely.

USAF is cognizant of these facts, and as a result, the Aero-Medical Laboratory at Air Materiel Command has commissioned a C-47 as an airborne Psychology Laboratory to determine just how a certain pilot reacts to certain air problems during flight.

The flying laboratory is equipped with special electronic scoring devices which record how accurately pilots are able to maintain heading, altitude, airspeed and the many other variables of flying. The laboratory makes it possible to give "field confirmation" to experiments that have been demonstrated in laboratories under simulated conditions.

Equipment consists of a motor generator, sensing units, a scoring console and a recording console. The generating plant, located in the aft section of the cargo compartment, is adjusted for continuous output at altitudes ranging from ground operation up to and including 20,000 feet.

The sensing units consist of potentiometers and hydraulically operated pick-ups which actuate the scoring and recording consoles. Whenever a pilot adjusts his instruments to correct a flight problem the sensing instruments translate the action into electrical impulses which are recorded for future study.

On the scoring console, electric stop clocks indicate the length of time during which a pilot is unable to stay within the allowed tolerance for such variables as airspeed, altitude, pitch, angle of bank, rate of turn, vertical speed, heading and glide path. Whenever he moves outside those tolerances the clocks stop, and the percentage of time the clock operates, compared with the total time of the test indicates the pilot's degree of proficiency.

A voice recorder and strategically-placed motion picture camera record the pilot's comments and his eye and body movements during the tests in the Airborne Laboratory, and are studied in relation to all other records of a particular flight.

One of the greatest problems of flying has always been that of fatigue, and the laboratory also provides some definite answers on that. A pilot may think a long flight doesn't tire him but the instrument scores make it pretty plain that the longer the flight the less able the pilot is to stay within the allowed tolerances. He is more likely to forget routine tasks which must be performed periodically, and there is a definite loss of proficiency in the performance of tasks which require complex skills involving a division of attention.

In the Airborne Laboratory the scientists also can test the effectiveness of various types of lighting for the cockpit and instruments, and a rheostat control makes it possible to study a wide range of intensities for each type of lighting.

Movement of the pilot's eyes during flight is another factor which can be checked. How often is each instrument observed during a particular maneuver? How much time is required for each instrument? Is there a definite pattern in cross checking the instruments? The answers to these questions will help determine the best designs for instruments and the best arrangement of instruments on the pilot's panels.

In all flights pilots make use of information they get from reference points outside the aircraft and information they get from their instruments. Flight instruments must be consistent with outside reference points . . . and at the same time they must be comprehensive enough so the pilot can rely on them completely when visibility is zero. During a letdown and low approach, or during takeoff the pilot has to be able to make a quick shift from what he sees outside to what he sees on his instrument panel.

At the present time aircraft instruments are not consistent in their "point of reference." Some regard the earth as a fixed point and indicate the changes in attitude of the aircraft, while others, particularly the artificial horizon, treat the plane as a fixed point and indicate the movement of the earth in relation to the plane's flight. At present there is no data to indicate whether one point of reference factor is better than the other but the problem is being studied.

Increased speed and instrument complexity of

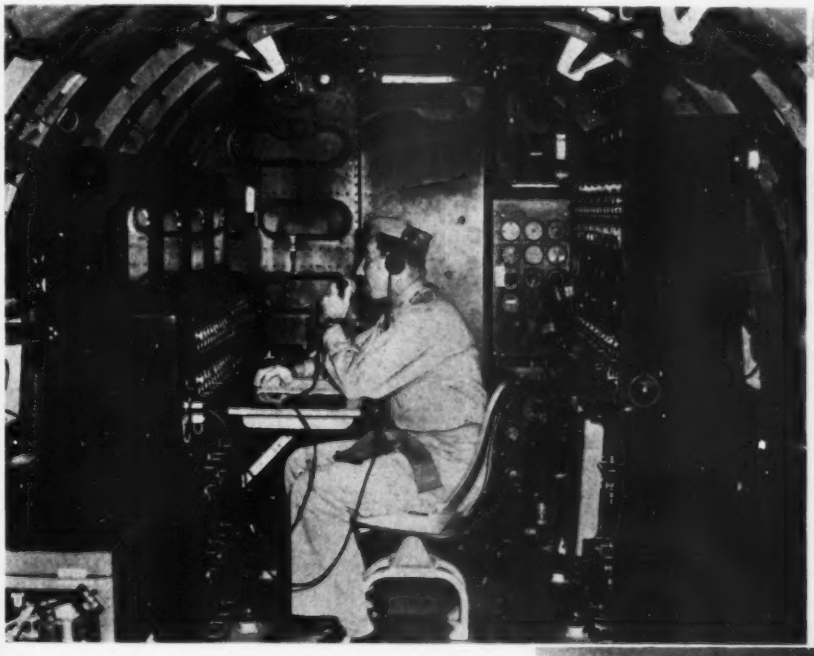
future aircraft will mean that the pilot of tomorrow is still going to have a rough time of it, but the data secured by AMC's Airborne Psychology Laboratory will go a long way toward helping him do his job more efficiently.

Looking into the future, Dr. N. E. Edlefsen, Associate Technical Director of the Aerophysics Laboratory of North American Aviation, reveals the plane of tomorrow as an automatic and practically fool-proof vehicle. In his article "Cybernetics," appearing in the magazine "Skyline," discussing the application of this new science of electrical calculating machine on problems of automatic flight control, Dr. Edlefsen predicts the pilots of jet interceptors of the future will merely go along for the ride, supplying intelligence in the airplane which would be difficult to build electronically.

During automatic interception of an enemy, the pilot will do little more than press buttons to supervise the action in the various phases of the mission, and even this will eventually be eliminated, said Dr. Edlefsen.

While Dr. Edlefsen hastens to state *the day of pushbutton defense has not dawned,* yet we certainly are at the threshhold of a new era of automatic control. His company's Aerophysics Laboratory is working on automatic airplane control systems and co-ordinating their work closely to solve today's most challenging military aircraft problems. The electronic brains will even keep the automatic controls or the pilot from damaging the airplane structurally through wrong or excessive application of controls in flight maneuvers.

A pilot's dream might even be to lie in bed with a bank of pushbuttons and let his jet do the work. With a piece of chalk he can mark on the wall the destruction of another enemy fighter. (U)



Every reaction of the pilot in the cockpit is checked in airborne laboratory. Instruments record eye and body movements in routine flight tasks and under conditions of fatigue. AMC program aims to reduce wear and tear on pilots, aid efficiency.

Pilots serve as guinea pigs in this C-47 which has been converted into a flying psychology laboratory. Studies will serve as a guide in determining the best designs and arrangements of aircraft instruments.

SCENT SENSE

FUMES IN AIRCRAFT CAN BE DANGEROUS— BUT THEY DO GIVE WARNING

The morning was cold and misty to the tense doughboys, who shivered slightly in the slit trenches as they faced the light wind blowing across the warfront of 1917. Suddenly a few of the men began to sniff the breeze. In a few seconds all of the doughboys smelled the odor, and those men who had known life on a farm identified the odor as that of new-mown hay and relaxed briefly in a harvest of memories.

But, the odor quickly grew stronger until the men were coughing, sneezing and rubbing grimy fingers across their smarting eyes; some were hastily unscrewing the top of their canteens for a drink of water. The irritation turned into agony as the soldiers grabbed their throats and choking, gagging, fell to the ground. In spite of rapid evacuation of the area and first aid by the medics, a number of men died that day in the poison gas attack. The odor of hay they smelled had been phosgene gas released by the enemy.

Today, thirty-three years later, it is possible, but fortunately not probable, for an aircrew to smell the odor of new-mown hay since carbon tetrachloride, which is still used occasionally as a fire extinguishing agent, produces phosgene gas. Nor is carbon tetrachloride the only chemical in the realm of hazardous possibilities that a pilot or an aircrew may encounter. For instance, carbon dioxide, which is widely used as a fire extinguishing agent, is odorless and is present in exhaust fumes, smoke, or a cargo of dry ice. This gas increases respiration, causing a sensation of suffocation and is irritating to the eyes and throat. It's a safe bet that no pilot or aircrewman today knows there may be over seventeen chemicals that, under certain conditions, give off poisonous fumes that can affect the judgment and perceptions and cause illness to a flight crew. A degree of fume propagation that might not be noticed on the ground could easily be of serious consequence, confined in an airplane. Carbon Monoxide, Carbon Dioxide and Carbon Tetrachloride are often suspected of being responsible for airplane accidents. Chemicals that are commonly used in airplanes are often mishandled and unsuspected by aircrews as being toxic or fume-producing, in nature. Coolant fluids, exhaust gases, fire extinguishants, fuels, hydraulic fluids and refrigerant fluids are classified by most of us as being relatively harmless, yet under emergency conditions created by structural failure, fire, leakage, etc., they become as deadly as the poison gases used in World War I.

For example, let's review one accident:

A fire in a C-54, cause undetermined, located between base of power unit and fuselage. Radio Operator attempted, unsuccessfully, to put out fire with pyrene extinguisher. Crew Chief could not get to the fire with CO_2 extinguisher because of concentration of smoke and fumes. Pilot successfully crash landed gear-up and crew abandoned aircraft. Non-fatal crew injuries: poisoning, acute, mild, accidentally incurred by breathing fumes from a pyrene fire extinguisher, while fighting fire while airborne.

Factors that must be taken into consideration are altitude, duration of exposure, seriousness of consequences of mild intoxication and confinement. To date very few studies have been made to determine the effect of altitude on toxicity. Studies in this field are currently under way.

Additional facts that are to be considered in any attempt to control toxic gases in airplanes are first, there is little likelihood that most toxic gases will be present in dangerous concentrations unless structural failure or similar emergency occurs. Periodic inspections are at present, and no doubt will continue to be, the most important safeguard against this hazard. Second, routine tests for all of the several possible toxic gases are impractical in most instances. Finally, since dangerous concentrations of toxic gases will be present in most instances, only as an emergency situation, it is important that the aircrew know about detecting these gases by their odor or other bodily effect.

The following chart is of importance to aircrew members in aiding them in recognizing and detecting these gases. Unfortunately, not all toxic gases or vapors have an odor and most odors are distinct and noticeable for only a short period of time. Other immediate indications of toxic gases are the presence of smoke, irritation of the eyes or throat, and the sensation of suffocating. Headache, nausea, weakness, drowsiness, excitement or other sensation, if present in an unusual degree, may be due to toxic gases or vapors. Alertness to the possible dangers is necessary for avoiding serious exposure, because fumes can be dangerous to flight. (R)

TOXIC GASES & VAPORS WHICH MAY BE PRESENT IN AIRPLANES

CHEMICAL	USE OR OCCURRENCE	ACTION	DETECTION
Alcohols	De-icing fluids, fuel. Constituents of hydraulic fluids.	Anaesthetic. Irritant to eyes and respiratory tract. Impairment of vision.	Fairly strong odor of alcohol. Irritation of eyes and throat.
Aldehydes and Ketones	Occur in smoke or in thermal decomposition of oil, etc. Constituent of hydraulic fluids, etc.	Irritant to eyes and throat. Anaesthetic.	Odor of banana oil. Irritation of throat.
Aromatic Hydrocarbons—Gas & Petroleum Products.	In gasolines, motor and heater fuel, lubricants, hydraulic fluids, etc.	Absorption through skin or lungs causing anesthesia, anemia, nausea, headache, leukopenia.	Odor of gasoline exhaust fumes.
Carbon Dioxide	Fire extinguishant. Occurs in exhauts fumes or smoke. Cargo (dry ice).	Increases respiration. Suffocation. Unconsciousness above 10 per cent.	Odorless. Stimulation causing sensation of suffocation. Irritating to eyes and throat.
Carbon Monoxide	Occurs in smoke and exhaust fumes.	Headache, dizziness; impaired judgment. Unconsciousness without warning.	Odorless, but presence indicated by exhaust fumes and smoke.
Carbon Tetrachloride	Fire extinguishant.	Produces phosgene gas, causing headache, dizziness, choking and irritation of the eyes.	Odor of new-mown hay. Irritation of eyes and respiratory tract.
Chlorobromomethane	Fire extinguishant.	Anaesthetic effects and irritant.	Odor of weak chloroform.
Freon F-12	Refrigerant	Decomposition in fire. Causes irritation and possible acid burns.	Very little odor. Can be noticed in fire as acid.
Glycols and Related Componds	Coolant. Constituent of hydraulic fluids.	Slight poisoning through inhalation. Slightly irritating.	Odorless but certain derivatives have odor similar to burning fat when in contact with fire.
Lead Tetraethyl	Constituent of Gas	Insomnia, restlessness, talkativeness, delusion and ataxia.	Odor of gasoline indicates presence.
Methyl Bromide	Fire extinguishant.	Anaesthetic effects; a disturbance of vision and speech; mental confusion.	Slight aromatic odor. Irritant fumes when in contact with fire.
Methyl Chloride	Refrigerant	Headache, dizziness and nausea, mental confusion, convulsions, etc.	Irritant decomposition as hydrochloric acid. Occurs in fire.
Nitrogen Dioxide	Occurs in exhaust fumes and fire.	Irritation of eyes and respiratory tract.	Acrid sharp penetrating coughing. Irritating to eyes and throat.
Sulphur Dioxide	Refrigerant	Irritation to eyes and respiratory tract. Death may occur from edema of the lungs or glottis.	Odor of rotten eggs. Irritation.

WHAT ABOUT SAFETY IN DESIGN?

FLIGHT SAFETY RESEARCH IS MEETING THE CHALLENGE FOR MORE BUILT-IN SAFETY FOR PILOT AND CREW

'PROJECT ENGINEER,' a brand-new, double-barreled approach to the problem of safety in aircraft and aimed at literally engineering maximum safety into the design of aircraft for the Air Force, has been launched by the USAF's Directorate of Flight Safety Research with the cooperation of five of America's leading aircraft manufacturers.

Primarily designed to aid in the engineering phase of aircraft accident prevention, the new program incorporates in the Directorate of Flight Safety Research the services of an engineer consultant from each of the five aircraft companies. These men, who have been selected on the basis of outstanding experience in the field of aircraft engineering, are specialists within their own separate fields and have a three-fold purpose in the combined search for the answers to the $64 questions on aircraft accidents stemming from materiel and design failures.

First, these engineer trouble-shooters, through study of current accident data and statistics, will be able to provide their companies with pertinent information on aircraft and equipment produced by them, as well as all equipment used by the Air Force, where such data can be of use in the elimination of unsafe characteristics in the production of future aircraft or in the modification of present models.

Secondly, the consultants will assist in a review of the Handbook of Instructions for Aircraft Designers to recommend changes for standardization or elimination of accident cause factors in design resulting from studies of current trends and UR's.

And third, provide technical advice on the UR program and provide overall information on accident factors affecting basic design of aircraft and power plants.

In working toward the goal of more safety in design and to find the answers as to the effectiveness of which materiel design is being applied to prevent aircraft accidents, the engineer consultants were chosen from separate fields. Mr. Gilbert Burnett of Lockheed Aircraft Corporation, is a specialist in aircraft electrical systems; Mr. A. S. Witchell, Jr., of Consolidated-Vultee, is a leading flight test engineer who has worked closely with the testing and development of the B-36; Mr. James D. Hoffman of North American, is a power plant specialist with considerable experience at AMC as well as in the aircraft industry.

Mr. William Steiglitz, an engineer for Republic Aviation Corporation who, with wide experience as a safety engineer, has done outstanding work in crash injury prevention, along with the problems in connection with aircraft structural resistance to crashes and seat ejection. The fifth consultant is Mr. Byron H. Galt of Boeing Aircraft Company, who is a specialist in general aircraft design.

The factory specialists are assigned to Flight Safety Research for a four-month period with new representatives replacing them at the end of this time on a rotation basis. The changeover is expected to diversify and broaden the experience level in the new program, both for the Air Force and the manufacturers, in addition to affording a closer understanding and evaluation of deficiencies affecting their own present equipment and future basic design.

"In the past," said Major General Victor E. Bertrandias, Director of Flight Safety Research, "safety was not the primary factor in aircraft design. Such basic requirements as adequate structural strength, safe wing loading, and adequate power were essential, but there was little study for refinements in the name of safety and little experience upon which the relative merits of design alternatives and quality of parts could be established."

Today, he emphasized, both the industry and the Air Force are intensely interested in building safety into the combat airplanes for the present as well as the future. He pointed out that the declining rate of accidents during the post-war years leaves little doubt of the importance of aircraft designs that are inherently safe.

Accidents tell only part of this story through providing many indications of which features of

Boeing's Galt watches the drawing of a Rex Riley safety poster.

aircraft design are safe and those which are unsafe. For example, a recent B-50 accident that cost heavily in the loss of equipment and human lives was traced directly to the malfunction of a circuit breaker that failed to do the job for which is was designed. This fact was brought to light by one of the engineer specialists assisting in the investigation following the B-50 crash.

Consequently, the particular style circuit breaker that caused the crash has been condemned for use or replacement by AMC. This does not mean to say that there will be no more crashes caused by faulty circuit breakers, but it does emphasize the fact that only with close cooperation and coordination with the aircraft manufacturer can the Air Force incorporate flight safety factors into design and modification of combat aircraft without the loss of time, money and lives; losses brought about by the necessity for rebuilding safety characteristics into planes after the Air Force has learned of failings by actual experience or accidents.

Design has become a major factor in flying safety, and 'Project Engineer' may prove to be a seven-league step forward in providing the Air Force and the manufacturer with information concerning development of new aircraft with emphasis on flight safety factors. This means the Air Force will receive planes that incorporate safety factors developed from operating experience without compromising the effectiveness of the airplane to perform the mission for which it was designed.

It is up to the pilot and crewmember to do their part by adequately and properly reporting malfunctioning equipment which, along with the contributions of these safety engineers, will guarantee them the best possible airplanes and equipment with which to carry out the missions of the USAF with greater safety than ever before.

An ex-Air Force pilot, Engineer Witchell looks up his Form 5.

Steiglitz of Republic explains a point common to all jets.

Lockheed's Burnett goes over the F-80 with an AF engineer.

Hoffman, North American Engineer, talks on safety in design.

Waterfront Heliport—A helicopter airport atop a waterfront warehouse is being maintained at the Seattle Port of Embarkation to expedite delivery to the port of high-priority military papers from inland Forts Lewis and Worden. Regular runs to the rooftop airport make delivery a matter of minutes instead of several hours. Standard airport markings in use include a windsock, white guide markings, and brightly colored flags to show obstructions.

Shelter for Fighter Planes—A weatherproof, easily erectable fighter-plane shelter, primarily for use in frigid climates, has been devised jointly by AMC, Navy Bureau of Aeronautics and General Textile Mills. Built to withstand 70 mph winds and a snow load of 30 lbs./sq. ft., the tentlike 4284-pound shelter has no internal supports or obstructions, being held by four aluminum poles and five roof trusses. It is insulated by an inner liner of glass cloth and a vinyl-coated fabric reflects heat and light.

* * *

'Chuting Landings—The new Lockheed F-94C is the first jet fighter plane to have an installation of a landing parachute as standard equipment. Production airplanes will be equipped with a sixteen-foot 'chute which will cut landing distances in half. Landing F-94C's can use their parachutes and then taxi with them extended. The jet blast keeps them open and out of the way. The landing parachutes can be repacked in five minutes. Other characteristics of the fighter is its ability to cruise at slow flight speeds, and the emergency power which permits a takeoff, after touchdown and roll, using the afterburner power.

No Magnets—Air Materiel Command calls attention to T.O. 01-1-402, dated 28 June 1950, which restricts the carrying of certain magnatrons and magnation in aircraft since they may cause improper operation of instruments and radio equipment.

* * *

10th ARS Reassigned—The recent assignment of the 10th Air Rescue Squadron in Alaska to the Air Rescue Service of MATS completes transfer of all USAF Air Rescue Squadrons to control of ARS. The transfer is expected to improve coordination and standardization of air rescue procedures.

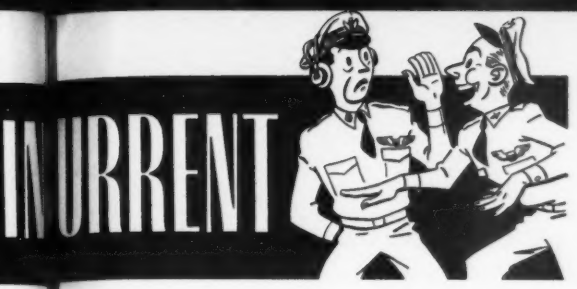
Crash Fire Projects—Air Proving Ground has launched tests of dry powder chemicals for combating aircraft crash fires, along with an evaluation of the crash firefighting trucks. The dry powder chemical fire fighting equipment is being considered to fulfill an arctic requirement for a unit that is operational at extremely cold temperatures, while the trucks are being tested in temperate zones for actual crash fire fighting ability and in the arctic zone for snow and ice and actual cold-weather operations.

F-94 Production Increased—Scheduled for increased production are Lockheed's F-94 all-weather jet interceptor; the T-33 jet trainer for USAF and the companion TO-2 jet trainer for the Navy. Orders for the new F-90 penetration fighter, a twin-jet high altitude interceptor, are expected. The F-90 has completed its USAF evaluation program at Edwards AFB.

New "Pack Plane"—Construction of the XC-120 transport plane, an experimental airplane having a detachable cargo compartment, has been completed by Fairchild. Similar in appearance to the C-119 and C-82, the new plane has an under compartment which can be modified to carry cargo or to serve as a temporary installation at a forward airfield. The 2700 cubic foot cargo "pod" can be quickly detached from the plane. The XC-120 also differs from the C-119 and C-82 in that it is equipped with quadricycle landing gear in place of the tricycle gear.

* * *

Northern Bases—At present, at least 23 bases in the Arctic and Far North can be used by the USAF. They include one in Iceland, eight in Canada, eight in Alaska, three in Greenland, two in the Aleutians and one in Labrador.



Tower Operations Consolidated—For more streamlined operations, CAA has ordered consolidation of airport traffic control towers and airways communications stations at 16 smaller airports. Such consolidations are possible only at airports which do not have heavy traffic. Where the new move is affected, communications stations will be moved physically into the tower.

* * *

"Banana" Tanks for Sabres—Designed to fit the contour of the F-86, a "banana-shaped" combat gasoline tank has been developed to give the Sabre greater range along with increased maneuverability. The new tank has less drag than the ferry tanks.

* * *

Superforts Modified—The first two of 16 Boeing SB-29 Superforts, especially modified for use by the Air Rescue Service, have been accepted for operations. The modified Super-forts will carry 30-foot all-metal lifeboats which are parachuted to survivors during air-rescue operations at sea.

* * *

Air Traffic Coordinated—By means of the "mechanical interlock," a new device CAA is installing at 33 airport control towers and 23 control centers, the movement of aircraft into the control zones of heavy-traffic airports during instrument weather conditions will be expedited. Use of the new device eliminates most of the verbal coordination, by means of push buttons and electronic circuits. When an aircraft is assigned to an altitude by the center, the tower is informed by a light on its instrument panel, actuated by a push button at the control center; if the tower assigns an altitude to an aircraft, the center is similarly advised.

MOS 594—Chanute AFB is training MOS 594's in the packing of parachutes, parachute inspection, the issuing of personal equipment, and in all phases of personal protective and emergency equipment. The MOS, called a Personal Equipment Technician, is presently under MOS 620, 594, and 609.

5301 Hours of Safety—The 55th Squadron of the 20th Fighter-Bomber Group has flown 5301 accident-free hours in 254 days. Equipped with F-84D Thunderjets, the 55th has taken part in three maneuvers, two firepower demonstrations, a show for USMA cadets, and has carried out heavy schedules in gunnery and instrument flight training during that time. Much credit for the outstanding performance was given to the crew chiefs and mechanics who kept the planes in top condition.

Automatic Parachute—A new back type parachute developed for the USAF features a quick adjustable harness and automatic canopy release. The new F-1 release allows crewmembers to bail out at high altitudes, pull an arming cable, and free fall to a safe altitude at which the parachute will automatically open. The F-1 release also provides for a 5-7 second time delay if bailing out at high speed below the altitude for which the release is set, thus insuring that deceleration to a safe speed has been made. The new parachute will weigh little more than the Type B-12.

Shhh-h-h-h-h-h-h—Guide issued to U. S. airmen in Britain says to "... keep American and English pay scales out of your conversation. American airmen are the highest-paid servicemen in the world. Do not belittle those who are paid less." Also, the guide suggests that U. S. Airmen not joke about who won the war, or paid for it.

* * *

Briefly Noted—Unofficial name for Republic's swept-back wings, fast-climbing XF-91 interceptor is "Thunderceptor" ... Army wants a 300-mph convertaplane capable of hovering at 5000 feet ... The Bell X-1A is expected to fly the first of the year and may reach a speed of 1700 mph ... The 92nd Bomb Wing at Spokane AFB will be next SAC unit to get B-36's ... Arthur Godfrey's comment on handling the controls of a T-33 at 520 mph was "Oh, brother!" ... Britain is developing a jet bomber with a 2000-mile radius of action ... Revolutionary waterborne jet fighter, designated the "Skate," will be a ConVair development. (U)

EMERGENCY BAILOUT

THE ODDS WERE STACKED AGAINST THEM . . .

At least five members of a B-29 combat crew operating in the Far East Bomber Command survived an explosion which sent their airplane into an immediate spin. They lived because they knew emergency procedures.

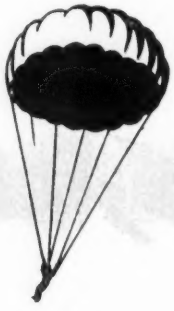
The entire crew, commanded by Capt. Allen Thomas, had extensive B-29 experience. They were a lead crew in the battle for Korea.

Takeoff and route out to assembly altitude of 19,500 feet were normal. During assembly, power was increased to 2,400 RPM and approximately 40" manifold pressure. This power had been used for approximately five minutes when an audible explosion occurred. A fire in No. 3 engine followed immediately. No. 3 was feathered and the fire went out.

The aircraft commander pulled out of formation, set course for home base and prepared to jettison his bomb load. At this time the Superfortress was depressurized and all crew members were on oxygen during an attempt to correct a malfunction in the lower forward turret. The CFC gunner had returned to the rear pressurized compartment and the engineer had just started to pressurize. Crew estimates were that the cabin altitude was approximately 11,000 feet at the time the fire occurred.

At the order of the airplane commander, the bombardier used the normal bomb bay door system to open the doors. When the rear doors failed to open, the commander pulled his emergency release handle and the rear doors opened. The area was cleared visually and the bombardier engaged his salvo switch. Six bombs in the rear bomb bay failed to release. The bombardier again engaged his salvo switch and all remaining bombs fell free. The third bomb from the bottom of the right-hand rack was observed to explode a short distance under the airplane. An explosion in No. 2 fuel cell followed immediately. These explosions were severe enough to blow the pilot's control column completely loose and start intense fires in the forward compartment. The plane commander was blown clear of his seat and landed on the aisle stand, as the airplane immediately went out of control, spinning to the right.

The commander engaged the alarm bell and phone call switches and the engineer cleared the debris from the forward entrance hatch and lowered the nose gear, which stuck approximately one-fourth of the way down. Considerable difficulty was experienced in opening the forward entrance door due to centrifugal force, but after considerable effort, the aircraft commander, pilot and engineer managed to get out, and the radio operator escaped through the forward bomb bay. The bombardier and navigator apparently were killed by the blast. In the rear compartment the radar operator and CFC gunner escaped through the rear



entrance door. The left scanner apparently was killed by the explosion and the fate of the other gunner is unknown. The tail gunner was presumed to have been trapped in his position by centrifugal force.

For various good reasons only one of the survivors had a one-man life raft attached to his parachute at the time of the jump. This raft tore free when he opened his parachute. The pilot was knocked unconscious, probably by the guns in the lower forward turret hitting him on the head during his escape. He fell free from 19,000 feet to approximately 3,000 feet before regaining consciousness and opening his chute and was therefore the first to hit the water. Shortly after hitting the water he observed a one-man life raft falling free and hitting the water about 150 yards from him. He swam to this raft and attempted to inflate it, but the impact had broken the carbon dioxide connecting hose, and the gas escaped into the water.

After about one and one-half hours effort, he managed to blow the raft up by mouth and get it in a serviceable condition. By this time the other four survivors had made their way to the raft and were hanging to it. The radar operator was suffering from severe shock and was placed inside the raft.

Soon after this a shark was sighted circling the raft at a distance of about 25 yards. Shark repellent was used and was effective. One other man was heard calling in the water but was never seen. Bail-out occurred at approximately 0900 and the survivors were rescued by a Japanese fishing boat at about 1800 hours. Because of injuries received in the explosion, shock, and chill from the water, the survivors believe that none of them would have lived through the night.

COMMENTS BY SURVIVORS:

All attributed their successful escape from the airplane to a careful training for emergencies and frequent practice of bail-out procedures.

The metal signal mirrors in the Mae Wests are unsatisfactory because the aiming hole is too large.

The bombardier had performed three meticulous rack checks prior to loading bombs. The racks had checked out satisfactorily.

The CFC gunner who observed the explosion stated that the arming wires and vanes were in place when the bomb fell free, and that it did not collide with another bomb or the airplane.

RECOMMENDATIONS BY HQ., FAR EAST AIR FORCES:

B-29 crews be instructed to jettison bombs in emergencies by dropping them in train at 50 feet intervalometer setting whenever possible, rather than salvo .(R)

ALTERNATE AIRPORT

Traffic Hazards Are Created When Pilots Clear Into Congested Areas With Only Minimum Fuel

Within the past few months there have been several emergencies declared by military pilots operating aircraft in metropolitan areas, such as New York, Boston, Chicago and Washington, D. C. These emergencies arose primarily because fuel supplies aboard the aircraft became critically depleted as a result of prolonged holding in the approach patterns and unexpected deterioration in the weather which resulted in missed approaches.

The large volume of traffic at New York, for example, is very carefully controlled through the use of approach control stacking and declarations of emergencies consequently cause disruption of the orderly flow of aircraft into airports with subsequent hazards to all aircraft in the area.

Aircraft should not be dispatched on IFR flight plans into congested areas with only a bare minimum of fuel supply. It is possible for pilots to comply with Air Force and CAA regulations pertaining to the selection of alternates, when clearing into the New York area, simply by their selecting other New York area airports which may be only a few miles away from their destinations. This may be a common practice for pilots planning flights into New York and it may be the underlying cause for these emergencies at other traffic centers.

It is suggested, therefore, that military pilots preparing for flights into Mitchel AFB, Floyd Bennett Field, Westchester County Airport, or any of the New York metropolitan airports, select alternates which are well away from New York stacking zones and in such direction that they do not lie within the weather frontal system which then prevails in the New York area.

This same suggestion for choosing alternates which can be reached safely and without disrupting traffic, can apply to other airports in the United States, where there is heavy concentration of commercial and military traffic.

If the *spirit* as well as the letter of Air Force Regulation 60-16 is followed for clearance on IFR flights, it is believed that there will be no need for military pilots to declare emergencies because of depleted fuel. (U)

FLYING SAFETY

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THE INSPECTOR GENERAL, USAF
DIRECTORATE OF FLIGHT SAFETY RESEARCH
Norton Air Force Base
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Maj. Gen. Victor E. Bertrandias, Director

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Editor
Maj. Homer P. Andersen

Art Editor
Capt. William M. Mettler

Assistant
M/Sgt. William C. Hautz

Contributing Editor
Ben H. Newby

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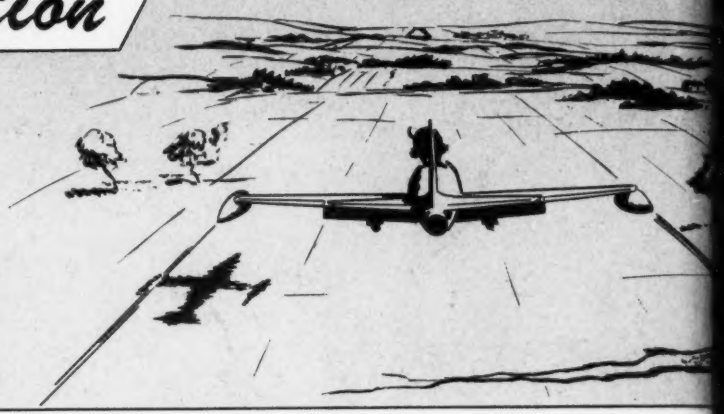
WHY?

After flying 50 miles on a VFR navigation training flight, the pilot of this F-51 discovered himself off course. He made a correction and checking his maps, found himself back on course in another 40 miles. Continuing to fly the corrected course, he crossed the Mississippi River and misidentified his position of crossing. Still relying on his pilotage, he continued his flight until he crossed the Wabash River, which, because of flooded conditions, he mistook for the Ohio River. He then mistook a check point on his map for a mining area in another State. His estimated time en route ran out and he attempted to tune in the radio station but was unable to orient himself.

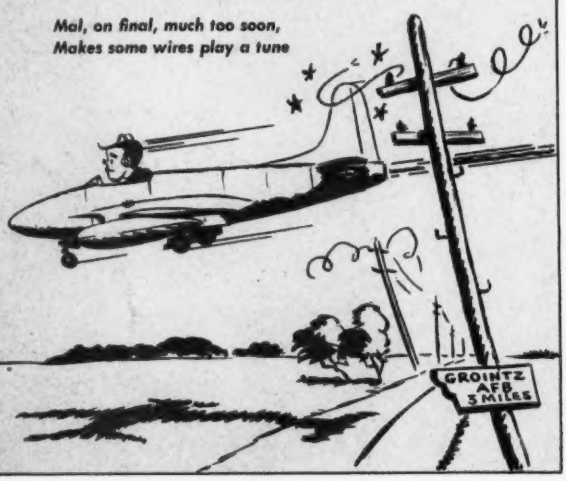
His original flight plan estimated one hour and 50 minutes en route which would have enabled him to land in daylight. After two hours and 15 minutes of flight it became night, and for an additional hour he attempted to locate his position. Finally, he sighted the lights of an emergency field, a grass strip common to the type maintained on civil airways. He attempted a long, slow, shortfield approach and as he started his turn on final, flipped on his landing light and discovered that he was only about 30 feet off the ground. Ahead he saw a pole of a power line; he ducked down in the cockpit, expecting an immediate crash. There was a sharp jar—his landing light went out but he still had control of the plane and landed on the strip. He was 40 miles from his destination. The next day it was found there was not sufficient fuel in the tanks to start the engine. (R)

Mal Function



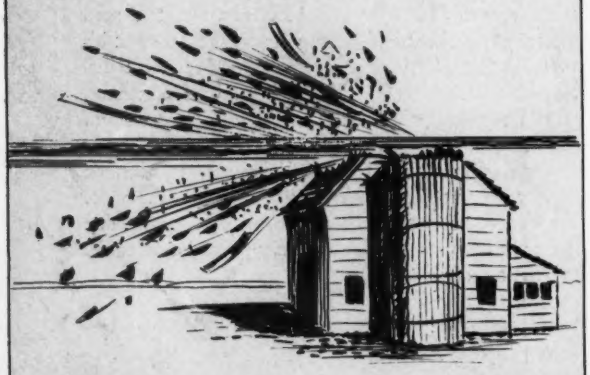
Landing field is far away;
Nearby fields are more for hay

Mal, on final, much too soon,
Makes some wires play a tune



Flying hardware, leaf and branch,
Follow like an avalanche

Decapitating silo yet
How undershot can this guy get?



It's really very racy sport
If you can live through landing short.

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